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Department of Information Technology

A

M&M PBL ON

SOIL MOISTURE DETECTOR

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ABSTRACT

The Moisture Sensor with Arduino project aims to develop a low-cost and accurate soil moisture sensing system using Arduino. The system consists of a soil moisture sensor, an Arduino microcontroller, and a display module. The sensor uses the principle of electrical resistance to measure the moisture content in the soil. The microcontroller processes the sensor data and displays the moisture content on the LCD display.

The project includes the calibration of the sensor using a known moisture content and corresponding resistance value. The calibration equation is then used to convert the sensor resistance into soil moisture content. The system can be powered using a USB cable or a battery, making it ideal for use in remote areas. This project provides an easy-to-implement solution for farmers, gardeners, and researchers to monitor soil moisture levels and ensure optimal plant growth.

INTRODUCTION

The Moisture Sensor with Arduino is a project that aims to develop an electronic system for measuring the moisture content in the soil. The system uses a soil moisture sensor, an Arduino microcontroller, and a display module. The sensor uses the principle of electrical resistance to measure the moisture content in the soil, and the microcontroller processes the sensor data and displays the moisture content on the LCD display.

Soil moisture sensing is important for various applications such as agriculture, horticulture, and environmental monitoring. The availability of water is one of the critical factors that affect plant growth, and overwatering or underwatering can cause damage to crops. The traditional method of soil moisture measurement involves manual observation and analysis of the soil, which can be time-consuming and less accurate. Therefore, an automated soil moisture sensing system is needed to monitor the soil moisture content accurately and efficiently. The Moisture Sensor with Arduino project provides an easy-to-implement solution for measuring soil moisture content and ensuring optimal plant growth.

Hardware Used

1. ARDUINO UNO:-

Arduino UNO is a microcontroller board based on the **ATmega328P**. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

2. RELAY BOARD:-

Relay is one kind of electro-mechanical component that functions as a switch. The relay coil is energized by DC so that contact switches can be opened or closed. A single channel 5V relay module generally includes a coil, and two contacts like normally open (NO) and normally closed (NC).

3. MOTOR:-

A Servo motor is a type of motor that is powered by a DC source, either from an external supply or by a controller. A small and

lightweight servo motor with high output power is called a micro servo motor sg90. The sg90 micro servo motor will only work as hard as is required to complete the task at hand. A wide range of applications for servo motors exists, including cameras, telescopes, antennas, industrial automation, and robots.

4. JUMPER WIRES:-

A jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards. By attaching a jumper wire on the circuit, it can bshort-circuited and short-cut (jump) to the electric circuit. By placing the jumper wire on the circuit, it becomes possible to control the electricity, stop the operation of the circuit, and operate a circuit that does not operate with ordinary wiring. Also, when specification change or design change is necessary on the printed circuit board, reinforcement of the defective part, partial stop of the unnecessary function, and change of the circuit configuration of the unnecessary output part by attaching or detaching the jumper wire can do.

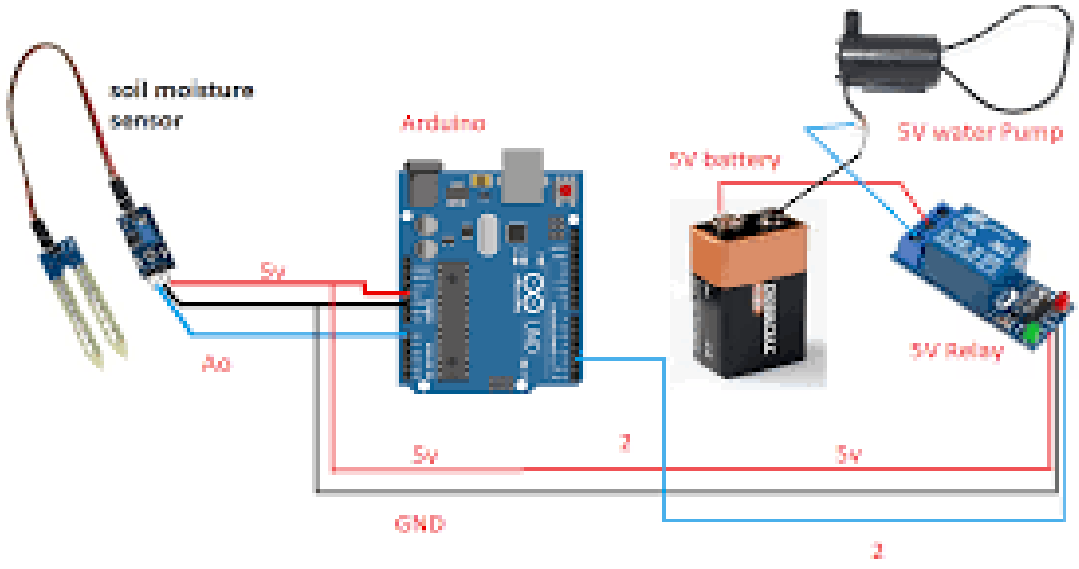
5. SOIL MOISTURE SENSOR:-

The soil moisture sensor is one kind of sensor used to gauge the volumetric content of water within the soil. As the straight gravimetric dimension of soil moisture needs eliminating, drying, as well as sample weighting. These sensors measure the volumetric water content not directly with the help of some other rules of soil like dielectric constant, electrical resistance, otherwise interaction with neutrons, and replacement of the moisture content.

6. BATTERY:-

The 9V battery is an extremely common battery that was first used in transistor radios. It features a rectangular prism shape that utilizes a pair of snap connectors which are located at the top of the battery. The performance and application of the battery can vary greatly between different chemistries, meaning that some chemistries are better suited for some applications over others.

CIRCUIT DIAGRAM



WORKING

The Moisture Sensor with Arduino works based on the principle of electrical resistance. When the soil is moist, it conducts electricity, and its resistance is low. Conversely, when the soil is dry, it resists electricity, and its resistance is high. The moisture sensor consists of two probes that are inserted into the soil. The probes are connected to the Arduino microcontroller through a voltage divider circuit.

The microcontroller applies a voltage to the probes, and the resistance of the soil between the probes is measured. The microcontroller uses the resistance value to calculate the soil moisture content using the calibration equation. The moisture content is then displayed on the LCD display module.

The calibration equation is obtained by measuring the resistance of the sensor at different moisture levels and correlating it with the actual moisture content. The equation is used to convert the resistance value to soil moisture content. The calibration process ensures that the sensor provides accurate and reliable measurements.

CODE

```
// Define the analog input pin for the soil moisture sensor
const int SOIL_MOISTURE_PIN = A0;

void setup() {
  // Start serial communication at 9600 baud rate
  Serial.begin(9600);
}

void loop() {
  // Read the analog value from the soil moisture sensor
  int soilMoistureValue = analogRead(SOIL_MOISTURE_PIN);

  // Map the analog value to a moisture percentage (0-100%)
  int moisturePercentage = map(soilMoistureValue, 0, 1023, 0, 100);

  // Print the moisture percentage to the serial monitor
  Serial.print("Moisture: ");
  Serial.print(moisturePercentage);
  Serial.println("%");
```

```
  // Wait for 1 second before taking the next reading
  delay(1000);
}
```

This code uses the analogRead() function to read the analog value from the soil moisture sensor connected to the A0 pin. It then uses the map() function to convert the analog value to a moisture percentage value, which is printed to the serial monitor using the Serial.print() and Serial.println() functions. The delay() function is used to wait for 1 second before taking the next reading.

Note that the actual mapping of analog values to moisture percentages may vary depending on the type and calibration of the soil moisture sensor used. You may need to adjust the mapping parameters to get accurate readings for your specific sensor.

User continue To use this code, you'll need to connect the soil moisture sensor to the Arduino Uno. The sensor usually has two wires, one for power (VCC) and one for signal (SIG). Connect the power wire to the 5V pin on the Arduino Uno, and the signal wire to the A0 pin.

APPLICATIONS

The Moisture Sensor with Arduino project has a wide range of practical applications, including:

1.Precision agriculture: The system can be used in precision agriculture to monitor soil moisture content in real-time, enabling farmers to optimize irrigation and fertilization practices. This can help increase crop yields, reduce water usage, and promote sustainable agriculture.

2.Greenhouse farming: The system can be used in greenhouse farming to monitor soil moisture content and ensure optimal plant growth. The system can be used to control irrigation systems and regulate the climate inside the greenhouse.

3.Landscaping: The system can be used in landscaping to monitor soil moisture content in public parks, golf courses, and other recreational areas. The system can be used to control irrigation systems and ensure that plants receive the right amount of water.

4.Environmental monitoring: The system can be used in environmental monitoring to study the effects of climate change on soil moisture levels and plant growth. The system can be used to collect data on soil moisture levels in natural ecosystems, such as forests and wetlands.

5.Education: The system can be used in education to teach students about electronics and programming, as well as the principles of soil moisture sensing.

CONCLUSION

In conclusion, the Moisture Sensor with Arduino project provides an efficient, cost-effective, and sustainable solution for measuring soil moisture content. The system is based on the principle of electrical resistance and uses two probes to measure soil moisture levels. The system is automated and can be powered using a USB cable or a battery, making it suitable for use in remote areas.

The system offers numerous advantages, including accuracy, efficiency, low cost, portability, real-time monitoring, and sustainability. The system has a wide range of practical applications, including precision agriculture, greenhouse farming, landscaping, environmental monitoring, and education.

Overall, the Moisture Sensor with Arduino project has the potential to revolutionize the way we monitor soil moisture levels and promote optimal plant growth. The system provides an easy-to-implement, efficient, and sustainable solution for measuring soil moisture content, reducing water wastage, and increasing crop yields.

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